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# *Myobia kobayashii draconis* ssp. n. (Acarina, Myobiidae) parasitic on *Apodemus draco semotus* (Mammalia, Muridae)

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**ABSTRACT**—*Myobia kobayashii draconis* ssp. n. parasitic on *Apodemus draco semotus* was described on all the stages. The host mice of the new and nominate subspecies, *A. draco semotus* and *A. peninsulae*, were suggested to be phylogenetically close to each other because of their myobiid ectoparasites being conspecitic.

## INTRODUCTION

Host-species specific parasites frequently bear information on relationships among their host animals [1, 2]. It is easily presumed that host animals harboring different parasites can not be conspecific, and that those that are parasitized by closely related parasites are relatives close to one another.

Mice of the genus *Apodemus* are thriving in the Far East, and 9 of 12 valid *Apodemus* species are distributed in this region [3, 4]. Systematic review of the genus *Apodemus* is now in progress [4, 5], while only 4 mice from Japan and Korea are known to be associated with respective parasitic mites of the genus *Myobia* von Heyden, which are so strictly host-species specific that they are useful as indicators in the host classification [6]. It is expedient to have a further study of myobiids of unexplored *Aodemus*, expecting derivative information on their host systematics.

I had an opportunity to begin the study with a *Myobia* mite parasitic on *Apodemus draco semotus* from Taiwan. This species was unexpectedly not a full species but a subspecies of *Myobia kobayashii* Uchikawa and Mizushima described originally as a parasite of *Apodemus peninsulae giliacus* [7]. Significance of finding this new subspecies of mite is discussed after describing it.

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## MATERIALS AND METHODS

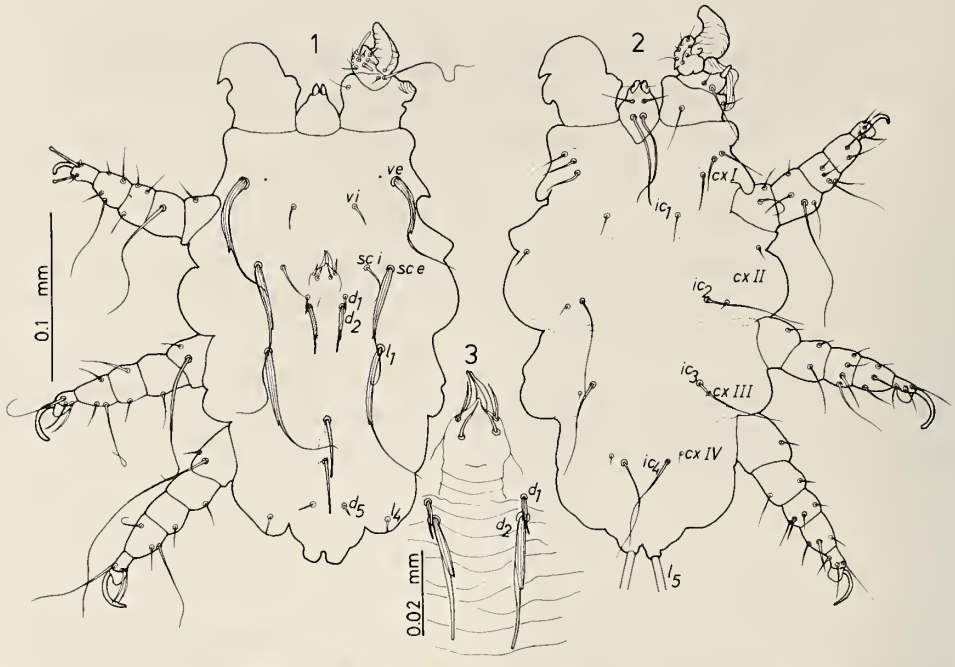
Alcoholic specimens of *A. draco semotus* were dried first and, then, were examined for myobiids under the dissectin miroscope at a magnification of ×10, combing hairs with the forceps. The origin of the speciemens is as follows: 5 specimens, Kunyan, Lenai, Nantou, Taiwan, October 8, 1986 (coll. Harada and Uchikawa); 1 from the same locality, June 10, 1986 (coll. Tsuchiya, KT-2908); 1 from Tsuifeng, Lenai, Nantou, Taiwan, June 10, 1986 (coll. Tsuchiya, KT-2909).

Mites were mounted on slides in the modified Hoyer's solution according to the routine procedures, and were examined microscopically. The measurements in the following description are in micrometers ($\mu$m).

### *Myobia kobayashii draconis* ssp. n. (Figs. 1–9)

*Male* (*Figs. 1–3*): Form of idiosoma, gnathosoma and legs and chaetotaxy as in Figures 1–3.

Body (idiosoma+gnathosoma) 300 (holotype) (280–320, 3 paratypes) long and 170 (165–180) wide. Vertical internal seta, *vi*, and scapular internal seta, *sc i*, nude, 13 (13–17) and 25 (23–27) long, respectively. Vertical external, *ve*, scacular external, *sc e*, and first lateral, $l_1$, setae strong,




Figs. 1–3. *Myobia kobayashii drconis* ssp. n., male. 1: Dorsal view. 2: Ventral view. 3: Genital region.

barbed and striated basally, 75 (67–75), 75 (?–80) and 75 (65–75) long, respectively. Two strong setae and 2 pairs of minute setae dorsally on opisthosoma (Fig. 1). Genital opening on the same level as bases of setae *sc i* and *sc e*; 2 pairs of minute and 1 pair of membranous setae on genital cone; first and second dorsal setae, $d_1$ and $d_2$, situated close to genital setae and 10 (8–10) and 28 (28–35) long, respectively (Fig. 3); penis 140 (143–150) long. Setation on idiosomal venter as in Figure 2; first intercoxal seta, $ic_1$, smaller than succeeding ones, $ic_{2-4}$; coxal setation as 3-2-1-1.

*Female*: Structure and chaetotaxy of idiosoma, gnathosoma and all legs essentially as in female of the nominate form. Measurements as follows: Body 400 (allotype) (380–450, 3 paratypes) long by 225 (220–230) wide; *vi* 40 (40–45) long; *ve* 90 (93–98) long; *sc i* 80 (68–73) long; *sc e* 80 (68–73) long; $d_{1-5}$ 60 (65–70), 75 (75–77), 88 (78–87), 15 (15–17) and 18 (20–21) long, respectively; $l_1$ and $l_3$ 70 (62–73) and 38 (38–40) long, respectively; $l_5$ slightly shorter than body length; ventral setae $ic_{2-4}$ fine and long; mutual distances of $ic_2$, $ic_3$ and $ic_4$ 95 (95–96), 95 (93–97) and 35 (35–40), respectively.

*Immature stages* (Figs. 4–9): Idiosomal dorsums of all the immature forms were illustrated in Figures 4–9 to compare them with those of the nominate subspecies in Uchikawa *et al.* [4]. Measurements for both subspecies are as follows:

| | New subspecies | Nominate subspecies |
|---|---|---|
| Larva(n) | (2) | (10) |
| BL (body length) | 235–240 | 165–220 |
| BW (body width) | 155–160 | 100–145 |
| *vi* | 8–8 | 5–8 |
| $d_1$ | 10–12 | 10–13 |
| | | |
| Protonymph(n) | (6) | (10) |
| BL | 193–265 | 193–258 |
| BW | 145–180 | 130–165 |
| *vi* | 7–8 | 7–11 |
| $l_1$ | 5–7 | 5–8 |
| $d_4$ | 8–10* | 3–5 |
| $l_1$ | 6–7 | 5–6 |
| $l_3$ | 7–9 | 6–10 |

| Deutonymph A-type(n) | (9) | (10) |
|---|---|---|
| BL | 212–250 | 220–290 |
| BW | 165–195 | 160–190 |
| *vi* | 10–11* | 15–23 |
| *sc e* | 8–17* | 18–30 |
| $d_1$ | 7–9* | 15–26 |
| $d_2$ | 7–8 | 7–17 |
| $l_1$ | 7–15* | 18–38 |
| $l_3$ | 8–10 | 10–15 |

| Deutonymph B-type(n) | (2) | (8) |
|---|---|---|
| BL | 300–300 | 200–305 |
| BW | 200–210 | 165–200 |
| *vi* | 9–10* | 15–20 |
| *sc e* | 10–12 | 5–11 |
| $d_1$ | 9–11 | 7–15 |
| $d_2$ | 7–8 | 6–8 |
| $l_1$ | 7–8 | 4–15 |
| $l_3$ | 9–10 | 8–10 |

| Tritonymph(small)(n) | (7) | (10) |
|---|---|---|
| BL | 250–280 | 280–340 |
| BW | 150–195 | 180–240 |
| *vi* | 13–15* | 20–26 |
| *sc e* | 25–33 | 25–40 |
| $d_1$ | 18–24 | 22–30 |
| $d_2$ | 15–22 | 18–28 |
| $l_1$ | 35–73 | 30–55 |
| $l_2$ | 17–23 | 20–28 |
| $l_3$ | 16–28 | 16–28 |

| Tritonymph(large)(n) | (8) | (10) |
|---|---|---|
| BL | 310–450 | 400–440 |
| BW | 215–255 | 230–280 |
| *vi* | 13–17* | 22–26 |
| *sv e* | 25–37 | 28–38 |
| $d_1$ | 20–24 | 28–28 |
| $d_2$ | 14–22 | 22–26 |
| $l_1$ | 32–72 | 26–50 |
| $l_2$ | 17–23 | 18–28 |
| $l_3$ | 16–26 | 19–27 |

Measurements for the nominate form are cited from Uchikawa *et al.* [4]. Asterisked ranges for the new subspecies are discrete from those for the nominate subspecies. Setations on the idiosomal dorsum and venter and on all the legs as in all the other Far East species [4].

Larva (Fig. 4) hexapodal, with well developed third legs. Protonymph (Fig. 5) with prominent $d_4$ longer than 8; mutual distance of $l_3$ subequal to that of setae $l_2$. Deutonymph (Figs. 6, 7) bearing well developed legs I-III and fourth leg primordials, which are sometimes segmented and setated (Fig. 7); A-type smaller, with rather rounded idiosoma (Fig. 6); B-type larger, with elongate idiosoma (Fig. 7); *vi* less than 11 long in both types. There is the third type of deutonymph, which bears some longer setae dorsally on idiosoma, although its body size is as large as A-type. Measurements for 2 specimens of this type are as follows: BL 230–265; BW 160–202; *vi* 9–12; *sc e* 16–22; $d_1$ 12–18; $d_2$ 8–9; $l_1$ 46–55; $l_3$ 11–12. Tritonymph consisting of small and large forms (Figs. 8, 9), with four pairs of well developed legs; distance between legs II and III/ distance between legs III and IV less than 2 in small form and more than 2 in large form; *vi* less than 17 long in both forms.

*Material examined*: Holotype male, allotype female, 2 paratype males and 2 paratype females, 14 tritonymphs (7 small and 7 large forms), 13 deutonymphs (A-type 8, B-type 2 and 2 others), 6 protonymphs and 2 larvae, *ex Apodemus draco semotus* (KT-2908), Kunyan, Lenai, Nantou, Taiwan, June 10, 1986 (coll. Tsuchiya); 1 paratype male, 1 paratype female and 1 large form tritonymph from the same host and locality, October 7, 1986 (coll. Harada and Uchikawa).

The holotype and allotype are deposited in the collection of the National Science Museum of Tokyo (NSMT-Ac10323 and 10324), and all the other specimens in my collection.

*Diagnosis*: *Myobia kobayashii draconis* ssp. n. is separable from the nominate sbuspecies only in the nymphal stages. The dorsal seta $d_4$ is distinctly longer in the new subspecies than in the nominate form in the protonymphal stage. The vertical internal seta, *vi,* is smaller in the new subspecies than in the nominate form in the deuto- and trito-nymphal stages. The first lateral seta, $l_1$, is significantly longer in the new subspecies than in the nominate form, although the ranges of setal length for both forms overlap each other. In the adult stage, the first dorsal seta, $d_1$, of the male is smaller in the new subspecies than in the nominate


Figs. 4–9. *Myobia kobayashii draconis* ssp. n., dorsal view of immature stages. 4: Larva. 5: Protonymph. 6: Deutonymph, A type. 7: Deutonymph, B type. 8: Tritonymph, A type. 9: Tritonymph, B type. Bar: 50 $\mu$m.

form, but it is impossible to separate both forms from each other by this character. Measurements for the male and female are usually larger in the new subspecies than in the nominate form, although such the diffences are not significant.

## DISCUSSION

*A. draco* was once considered as a subspecies of *A. sylvaticus* but it is presently dealt with as a valid species [1, 2]. *Myobia* mites parasitic on *A. draco* and *A. sylvaticus* are *M. kobayashii draconis* ssp. n. and *M. multivaga* Poppe, respectively, indicating that both hosts represent different species.

Xia [2] divided *A. draco* into 3 subspecies. Although confirmation is necessary, all of these subspecies are thought to harbor *M. kobayashii draconis*, since there is no example, in which different myobiids are found on different subspecies of a given host species.

In Europe, *A. sylvaticus* and *A. flavicollis* share the common myobiid, *M. multivaga*, but so far known hosts of *Myobia* in the Far East are associated with respective mite species as mentioned above. *A. draco* was the first mouse to yield the mite condspecific with that of the other valid *Apodemus*, *A. peninsulae*. This suggests that both host mice are phylogenetically very close to each other. Xia [2] assigned *A. draco* to the subgenus *Sylvaemus* together with *A. peninsulae* and other Chinese species, indicating that all members of this subgenus are closer to one another than to any species of the subgenus *Apodemus*. However, no mammalogists pointedly emphasize a closer relationship between *A. draco* and *A. peninsulae*.

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